(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 389 017 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 90200457.1

(51) Int. Cl.5 C08J 9/40, C08J 9/42, B29C 67/20, B32B 5/18

(22) Date of filing: 27.02.90

(30) Priority: 23.03.89 BE 8900324

(43) Date of publication of application: 26.09.90 Bulletin 90/39

(84) Designated Contracting States: AT BE CH DE DK ES FR GB GR IT LI LU NL SE

(71) Applicant: RECTICEL
De Broquevillelaan 12
B-1150 Sint-Pieters-Woluwe(BE)

(72) Inventor: De Ruyver, Stefaan
Vagevuurstraat 44
B-9270 Laarne(BE)
Inventor: Debaes, Bernard
De Streep 4
B-8340 Dämme-Sijsele(BE)
Inventor: Joos, Patrick
Schooldreef 125
B-9219 Gentbrugge(BE)
Inventor: Van Doorsselaere, Christiaan
Driesstraat 108
B-9140 Zele(BE)

(74) Representative: Callewaert, Jean et al
Bureau Gevers S.A. rue de Livourne 7 bte 1
B-1050 Bruxelles(BE)

(54) Method for manufacturing an element with a synthetic foam layer and element obtained by that method.

(57) A method for manufacturing an element with a synthetic foam layer, which is covered on at least one side with a finishing layer, whereby there is started from a layer (1) of substantially flexible mainly open cell synthetic foam which is at least partially impregnated with a liquid comprising NCO-groups, wherein, after having at least partially impregnated said synthetic foam layer (1) with said liquid comprising NCO-groups, said impregnated synthetic foam layer is brought together with a finishing layer (4, 4'), a whole (8) constituted of those layers (1, 4, 4') being compressed and, in said compressed state, steam is brought at least in said synthetic foam layer (1) at such a temperature and during a sufficient time that said NCO-groups of said liquid should react with said steam.

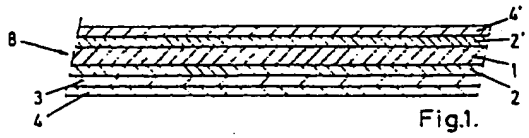

Fig.1.

EP 0 389 017 A1

The invention relates to a method for manufacturing an element with a synthetic foam layer, which is covered with at least one finishing layer, whereby there is started from a substantially flexible mainly open cell synthetic foam which is at least partially impregnated with a liquid comprising NCO-groups which liquid polymerizes by reaction with water and, for example, forms a reinforcement of said layer.

In the methods known by now for reinforcing flexible open cell materials, such as polyurethane foam, according to said impregnation technique, the thus impregnated material is sprinkled with catalysed or not water which then reacts with those NCO-groups after the impregnation with liquid comprising NCO-groups. This method however shows a number of fundamental drawbacks. As soon as it is sprinkled with water, the potlife of the preimpregnated foam is very short. It is thus impossible to form a stock of partially finished products, whereon for example only a specific decorative outlayer, in function of the choice of the client, has to be applied at the moment of the furnishing. In the present trend of just in time delivering this is certainly very important.

Further during the sprinkling of the water, the reaction with the NCO-groups is partially started before the other layers can be applied. This can then also lead to partial delaminations and/or insufficient adhesion of the different layers.

Another drawback of those methods is that the necessary heath for the reaction between the water and the NCO- groups has to be supplied by conduction starting from the outer surface of the element to be manufactured. Due to this, the temperature of the outer surface is often very high, so that a sufficient heat transfer to the core can be realised, in an economical acceptable cycle time. Heat sensible textiles can therefore often not be used for finishing layer such as velvet. This means then also that with such a heating technique, the thickness of the element has to be relatively limited.

Further, in certain cases, for example when the core of the synthetic foam is covered with a moist permeable textile covering, the problem of bleeding through of the impregnation liquid towards the covering can occur.

This drawback then also results in a high lost percentage. In order to provide a solution to that problem, a synthetic film is often applied which acts as a screen between the core and the outer textile covering. That film shows on its turn the drawback that the acoustic characteristics of the thus formed element are substantially reduced. This is indeed a known phenomenon for all acoustic absorbing materials which are covered with an air-proof foil.

The invention has mainly as object to present a method which not only allows to provide a solution for the above mentioned drawbacks but shows moreover a number of important additional advantages which will be described in more details hereunder.

The method according to the invention is characterized in that after having at least partially impregnated said synthetic foam layer with a liquid comprising NCO-groups, that impregnated synthetic foam layer is brought together with a finishing layer, the whole of those layers is compressed and, in that compressed state, vapour is brought at least in the synthetic foam layer at such a temperature and during sufficient time that the NCO-groups of said liquid should react with the steam.

In a particular embodiment of the invention, said whole of different superimposed layers is brought into a pressing mould, wherein thereafter steam is injected under low pressure, in such a manner that this steam penetrates into the impregnated synthetic foam and reacts with the liquid comprising NCO-groups which are present in the latter.

In a more specific embodiment of the invention, said whole of different superimposed layers is submitted to a moulding and/or lamination during or before said steam penetration.

The invention also relates to a roof-covering, a door panel, a floor mat, and the like for automobile interiors obtained by application of the above described method.

Other particularities and advantages of the invention will become clear from the description given hereunder of some particular embodiments of the method and of elements obtained by application of the method according to the invention ; the description is only given by way of example and does not limit the scope of the claimed protection ; the references used hereafter relate to the figures.

Figure 1 is a schematic cross-section of a part of a particular embodiment of an element obtained by application of the method according to the invention, however before it was submitted to the action of the steam.

Figure 2 is a schematic representation of one of the most important steps of a first embodiment of the method according to the invention.

Figure 3 is in a certain way an analogous representation of the same step according to a second embodiment of a method according to the invention.

In the different figures, the same references relate to the same or analogous elements.

The method, according to the invention, for manufacturing an element constituted of several layers and having a synthetic foam layer, which is preferably submitted to a well determined design generally comprises the following successive steps

1°) the impregnation of a flexible synthetic foam layer, for example polyurethane foam, with a liquid comprising NCO-groups ;

2°) the possible supply of a reinforcement layer on both sides of the synthetic foam layer, such as for example glass fibers, non-woven glass fiber mats or glass fiber fabrics ;

3°) the possible application of a protection foil of a thermoplastic synthetic material in order to avoid the bleed through of chemicals, more particularly of the liquid comprising NCO-groups, whereby that synthetic material shows adhesive properties in a molten or partially molten state, in such a manner that this one can act as an adhesion layer in that status.

4°) the application of a finishing layer on at least one of the sides of the synthetic foam layer, which is for example formed by a textile fabric allowing the penetration of steam :

5°) the compression of the whole constituted of the different layers by the action of steam at such a temperature and during a sufficient time that, on the one hand, the possibly present synthetic foil can at least partially melt, and on the other hand, the liquid comprising NCO-groups can react with the steam for forming a flexible or not polymer in the synthetic foam layer.

Thus, the whole 8, shown in figure 1, comprises for forming of this particular embodiment of an element according to the invention, a core 1 of open cell synthetic foam, which beforehand has been impregnated by a liquid comprising NCO-groups, and which on both sides of that core comprises a reinforcement layer 2 respectively 2', which can for example be constituted of a mat in glass fiber, a protection foil of thermoplastic synthetic material 3 on the reinforcement layer 2, on the side of the core 1 which is oriented towards the visible surface of the element, and finally a finishing layer 4 respectively 4' applied on each side of those reinforcement layers 2 and 2', which thus form the outer layers of the element.

It has also to be mentioned, because figure 1 concerns a schematical representation in cross-section, that the relative thickness of the different layers are not necessarily represented at the correct scale ratio.

In figure 2 a vertical cross-section of a mould 5 constituted of two parts is schematically represented in its open position, which mould is mounted in a not shown press.

That press comprises two mould parts 6 and 7 which can be moved with respect to each other and between which the whole 8 of the different superimposed layers is brought.

The mould part 6 is constituted of a hollow body wherein, steam is blowed via openings 9, as indicated by the arrows 9', which steam then leaves that mould part along a series of small holes 10, which are regularly distributed over the mould surface 11 of the latter.

The mould part 7 is also constituted of a hollow body whereby in the mould surface 12 thereof a number of small holes 13 are present, which are also regularly distributed in an analogous way as is the case in the mould surface 11 of the mould part 6.

Openings 14 are provided in the side of the mould part 7 which is situated at the other side with respect to that surface 12, which openings are connected on a not represented vacuumpump, which pump allows to suck an excess of steam, after the latter has crossed the whole 8 of the different layers.

That press is advantageously used for the application of the hereabove described fifth and sixth step according to the invention.

With the mould of the press in its open position, as represented in figure 2, the whole of the superimposed layers is put between the mould parts 6 and 7 with the layer 4, which has to form the visible surface, on the mould surface 12 of the mould part 7. The mould is thereafter closed by bringing the mould parts 6 and 7 towards each other, so that a well defined shape can be given to the whole 8 of superimposed layers. Thereafter steam is brought in the mould part 6 via the openings 9, while at the same time the vacuumpump is activated. This has as consequences that the steam will penetrate through the small holes 10 into the whole 8 which is pressed between the mould parts 6 and 7. Due to this, the steam will first penetrate via the small holes 10 through the porous layers 4' and 2' to the core 1 and a fast reaction will occur between the NCO-groups and the steam. Thereafter or possibly during this reaction, the synthetic foil 3 will melt which has as a consequence that the steam will further penetrate through the finishing layer 4 and will be sucked via the small holes 13 in the mould part 7. In this way the whole 8 of superimposed layers is completely and in a nearly homogeneous way crossed by the steam and a reaction will occur between the NCO-groups and the steam for forming a solid synthetic foam core. That reaction also provides that the reinforcement layer shows a very good adhesion with the core. Due to the fact that this was flexible before the reaction, care can be taken that this reinforcement layer partially penetrates into the core 1 during the compression of the mould 5 constituted of two parts.

It is important to note that the synthetic foil originally prevents the further penetration of the steam into the finishing layer 4 and this until the reaction with the NCO-groups has sufficiently pro-

gressed. Only after all risks of bleeding through of the impregnation liquid from the core 1 into the finishing layer are excluded, the synthetic foil 3 is nearly completely brought to melting and the excess of steam can thus further penetrate into that finishing layer 4 and can then be sucked via the openings 13 of the mould part 7.

Further the synthetic foil 3 which has been brought to melt takes care that the finishing layer 4, also thanks to the applied pressure, shows a good adhesion with the reinforcement layer 2 and eventually with the core 1.

As soon as the reaction between the steam and the NCO-groups is finished, the mould is opened and the thus formed solid element can be taken away from the mould.

In an advantageous way, a flexible synthetic foam can be provided between the protection layer, which is formed by a synthetic foil 3, and the finishing layer 4. That flexible synthetic foam is preferably fixed beforehand at the other side of the finishing layer, for example by flame laminations or other gluing techniques.

In order to realize a fast reaction between the NCO-groups and the steam before the melting of the synthetic foil 3, use is made in an advantageous way of the steam or overheated steam at low pressure, generally maximum 10 bar, until a temperature of 120 to 400 °C and preferably of 120 to 160 °C. In that way, a bleeding through of that liquid towards the finishing layer is avoided.

The protection foil 3 generally consists of polyethylene, polypropylene or a copolymer of ethylene and propylene.

Good results were obtained by using a core of substantially open cell flexible polyurethane foam on the basis of polyisocyanate and polyether, hereafter called polyether foam, which is at least partially impregnated with a mixture comprising an isocyanate which preferably comprises trichloromethane.

This isocyanate can for example consist of a diphenylmethane-4,4'-diisocyanate monomer which comprises low polymers, such as dimers and trimers and other derivatives and is known under the name "crude MDI".

In figure 3 the two mould parts 6 and 7 were represented in closed state, contrary to what is the case.

That figure however represents an embodiment of a method according to the invention which is distinguished from the one illustrated in figure 2 by the fact that use is made of a finishing layer, which is not only steam-proof but also obtains, on its own during the process, in the mould a certain shape and a good solidness. The use of a protection layer 3 is thus no longer necessary. In that embodiment the excess of steam is not taken away via the mould part 7 but via the outer walls of the mould.

In an alternative of that embodiment, the small holes 13 in the mould part 7 could be omitted. In order to avoid that the steam leaves the press via the outer walls of the mould, the mould part 6 could further be subdivided into two chambers 6a and 6b by means of a dividing wall 17, whereby in one of the chambers 6a steam could be blowed in and in the other chamber 6b steam could be sucked.

In certain cases, there could also be provided a synthetic foil 3 even on the side of the synthetic foam layer which is provided to be oriented towards the body. That layer will then mainly play the role of adhesion layer. In any case, the steam is generally applied on the side of the whole of superimposed layers, which side is destined to be mounted at a non visible part, in such a manner that the steam will first come into contact with the impregnated synthetic foam and only thereafter with the protection layer between the latter and the finishing layer.

Although an element obtained according to the invention can in principle show different shapes and can be provided for the most different applications, the method according to the invention can in particular be applied for the manufacturing of roof coverings, door panels, door mats, and the like for use in automobiles.

For further illustration of the invention, some specific examples will be given hereunder.

Example 1

This examples relates to the manufacturing of a roof covering for automobiles.

Hereby there is started from a sheet 1 of open cell flexible polyether foam having a density of 15 kg per cubic meter and a thickness of 6 mm. That foam was in a first step impregnated with so-called "crude MDI", diluted with trichloroethane (80 % MDI, 20% trichloroethane). The absorption by that flexible foam of that mixture comprising NCO-groups has been adjusted in such a manner as to obtain a final density of 25 kg per cubic meter.

On both sides of that sheet constituted of polyether foam a reinforcement layer 2 and 2' was applied in the form of a glass membrane with a weight of 150 g/m^2. On one of those reinforcement layers 2 a polyethylene foil 3 of 30 micrometers was thereafter applied, with as purpose to avoid the bleeding through of liquid chemicals towards the textile fabric 4 provided as finishing layer on the visible side. At the side which is provided to be applied against the bodywork a light polyester stack membrane 4' of 50 gr/m^2 was applied as finishing layer, which at the same time also fixes

the glass fibres of the layer 2', in order to easen the manipulation of the final product.

The whole was then brought into a mould, such as represented in figure 2, and in a way described hereabove. After closing the mould the isocyanate transformed into a hard polyurea by the injection of steam in such a manner that after demoulding the element remained in the same shape as obtained in the press.

At the side of the fabric 4, just before the closing of the mould, a steam push was given in order to relax the fabric and thus obtain a better shape without folds.

The temperature of the applied steam was comprised between 140 and 150° C.

Example 2

This example relates to the manufacturing of a door panel for automobiles and trucks. In that example use was again made of a flexible open cell polyether foam 1, this time with a density of 18 kg/m³ and a thickness of 15 mm. This foam was impregnated with a solution of prepolymer on the basis of "crude "MDI" and a reactive polyol, in such a manner that after impregnation a semi-hard but however tenacious material is obtained. More particularly that prepolymer was made of 100 parts "crude MDI", 50 parts polyol with a molecular weight of 6,000 and a functionality of 3, with a rest NCO of 20 %. This was then diluted so that finally a mixture of 80 % prepolymer and 20 % trichloroethane was obtained.

At one side of the thus impregnated polyether foam plate a glass mat 2' of 600 g/m² was applied. On the opposite side, which forms the interior side, a decorative layer 4 was applied after having first applied a polyethylene foil 3, which decorative layer 4 consists of synthetic leather applied on a flexible synthetic foam layer as underground.

Due to the fact that this synthetic leather is nearly steam-proof, use was made of a press having two chambers 6a and 6b divided by means of a dividing wall 17, corresponding with the mould part 6 shown in the figure 2. This is represented in figure 2 by means of a broken line. The steam was inputted in one of these chambers 6a in order to penetrate by means of holes provided in the latter into the side of the element which is opposite to the synthetic leather layer of the element and was thereafter sucked, as indicated by the arrows 16, in another room 6a of the same mould part. The other mould part does not show such holes and thus serves only as support for the element. Thanks to the presence of a polyethylene foil there was prevented that this prepolymer should penetrate into the under side of the synthetic leather, so that the latter remains flexible.

The prepolymer was so chosen that after treatment with steam a semi-hard polyurea foam was obtained which has permanently taken the shape of the mould in the press. Further the thus obtained panel shows very good shock-absorbing properties.

Example 3

That example relates to the manufacturing of floor mats for automobiles, which consists of the same type of layers as represented in figure 3. Hereby there is started from a sheet 1 of flexible open cell polyether foam with a density of 15 kg/cm² and a thickness of 35 mm. This polyether foam plate 1 was impregnated with a mixture on the basis of "crude MDI", so that finally a foam with a density of 30 kg/m² was obtained, of which the hardness ranges between 4 and 6 kPa (CDH 40 %). This was obtained by making use of a mixture which consists of 100 parts of "crude MDI" plus 100 parts of a polyol with a molecular weight of 4,000 and a functionality of 2, 50 parts softener dibutylphthalate and 50 parts Thermolin 101 (Olin). Thereto 100 parts softener dibutylphthalate have been added.

For forming the floor plates in question, use was further made of a press, as represented in figure 3. On the under mould of the press, which thus consists of the mould part 7, a heavy mass of 4 to 5 kg/m² was applied which was constituted of EVA-EPDM polymer mixture (ethylvinylacetate-ethylene-propylene-diene terpolymer) with 70 % by weight barium sulphate known as heavy spar. That heavy layer 4 was first heated and then formed on the under mould, via vacuum shaping. Thereafter the impregnated foam 1 was put on top of that mass. On the layer situated at the opposite side of the heavy mass a light polyester stack membrane 4' of 50 gr/m² was applied on the thus impregnated foam.

The purpose of that reaction was to reinforce the flexible open cell polyether foam which was used as core 1, and to give it a remaining deformation and a good fixing to the heavy mass and to assure the polyester membrane. After closing the mould overheated steam at a temperature of 150 to 180° C was injected in the upper mould, in particular in the mould part 6. That steam penetrated via the small holes 13 through the polyester stack membrane into the open cell foam for thereafter leave the mould along the outer walls, as indicated by arrows 15. In that example the foam layer remains relatively flexible, even after the reaction of the prepolymer with the steam. The time of the action of the steam was 15 seconds. Thus the total production cycle remained under two minutes.

The invention is in no way limited to the embodiments described hereabove and within the scope of the invention several modifications could be applied, i.e. for what it concerns the different used layers, which a.o. is determined by the destination of the element to be formed.

Thus for example use can be made of polyamide or polyester foils as protection foil 3, for example in function of the kind of the outer finishing layer, more particularly of the used type of textile.

Also instead of thermoplastic foil as protection layer, use can be made of a foil which can be dissolved in steam or of a material that decomposes starting from a certain temperature and on the same moment becomes permeable to steam. Material which can be solved in the presence of steam is for example polyvinyl alcohol, which is a polymer soluble in water.

Further that finishing layer can be constituted of a stack membrane, knitting stuff and even not permeable materials, as is actually the case in example 3. A finishing layer of plastic, hardboard, Woodstock (G.O.R.), metal, wood, or a skin of polyurethane or any other elastomer formed by spraying.

Important however is that at least one of the sides of the whole constituted of several layers comprises at least one side which is permeable for steam, possibly after the melting of one of the layers in such a manner that this can be brought into contact with the considered NCO-groups with which the core is at least partially impregnated.

As demoulding agent, such as described in example 3, use can for example be made of a "Teflon" film.

For some applications, the synthetic foam forming the core can for example be partially moistened, for example only superficially, with a liquid comprising NCO-groups, in such a manner that, in that case, the part of the core situated in the middle remains unmodified during the shaping. This can for example be the case when use is made of a relatively thick synthetic foam plate as core.

Further, as becomes clear from example 3, the meltable synthetic foil can possibly be omitted, for example when there is no risk of bleeding through towards the finishing layer. This is among others the case when this one is totally impermeable for chemicals, more particularly for the liquid comprising NCO-groups.

In some elements manufactured according to the method of the invention, the plastic core can remain relatively flexible, as is the case in example 3. This is especially valid when one of the layers consists of a relatively rigid material of which the shape remains after the shaping in the press.

It is also not absolutely necessary that the steam goes first through the foam layer and only thereafter through the finishing layer. In certain circumstances it could however be necessary that the steam first penetrates through the finishing layer and only thereafter through the impregnated foam layer. The possibility exists thereupon that the steam is applied on both sides, for example for the manufacturing of a floor mat, such as in example 3, but where at the other side of the heavy mass, a mat would be applied. This at the same time signifies that it is not absolutely necessary to suck under vacuum conditions.

The used steam can be as well saturated as overheated.

If the impregnation liquid for the foam layer also comprises polyol, the type of the latter can be so chosen that for the preparation of for example a prepolymer on the basis of diphenylmethane-4.4'-diisocyanate and/or derivatives of the latter, the reaction product after the treatment with the steam results in flexible, semi-hard or hard impregnated elements starting from a flexible foam layer.

Preferably, use is made of solvents which are not very volatile and especially of water for preparing said NCO-groups comprising liquid.

Claims

1. A method for manufacturing an element with a synthetic foam layer, which is covered on at least one side with a finishing layer, whereby there is started from a layer (1) of substantially flexible mainly open cell synthetic foam which is at least partially impregnated with a liquid comprising NCO-groups, characterized in that, after having at least partially impregnated said synthetic foam layer (1) with the liquid comprising NCO-groups, that impregnated synthetic foam layer is brought together with a finishing layer (4,4'), the whole (8) of those layers (1, 4, 4') being compressed and, in that compressed state, steam is brought at least in the synthetic foam layer (1) at such a temperature and during a sufficient time that the NCO-groups of said liquid should react with the steam.

2. A method as claimed in claim 1, characterized in that for a finishing layer (4,4') use is made of a steam permeable layer composed of fibers.

3. A method as claimed in one of the claims 1 or 2, characterized in that a reinforcement layer (2,2'), constituted of for example glass fibers, is applied on the synthetic foam (1).

4. A method as claimed in one of the claims 1 to 3, characterized in that said whole of different superimposed layers is brought into a pressing mould (5), wherein steam is thereafter injected under pressure, in such a manner that this steam

penetrates into the impregnated synthetic foam (1) and reacts with the liquid comprising NCO-groups which is present in the latter.

5. A method as claimed in one of the claims 1 to 4, characterized in that said whole (8) of different superimposed layers (1, 2, 2', 4, 4') is submitted to a shaping and/or lamination during or before said steam acts thereupon.

6. A method as claimed in one of the claims 1 to 5, characterized in that a protection foil (3), which is substantially impermeable for the liquid comprising NCO-groups, is applied between the synthetic foam layer (1) and the finishing layer (4,4'), which protection foil becomes steam-permeable by action thereupon of the steam.

7. A method as claimed in claim 6, characterized in that use is made of a thermoplastic synthetic foil (3) which can at least partially melt by action thereupon of the steam.

8. A method as claimed in one of the claims 6 or 7, characterized in that use is made of a protection foil (3) which is modified by the action of the steam into a steam permeable adhesive layer allowing the surrounding layers (1,2,2',4,') to stick to each other.

9. A method as claimed in one of the claims 6 to 8, characterized in that the steam is inputted into the whole (8) of the different superimposed layers (1,2,2',3,4,4') on the side of the synthetic foam layer (1) which is situated at the opposite of the synthetic foil (3), in such a manner that the steam first penetrates into that synthetic foam (8) before it comes into contact with that foil (3).

10. A method as claimed in one of the claims 1 to 9, characterized in that steam is used at a temperature comprised between 120 and 400° C, preferably between 120 and 160° C.

11. A method as claimed in claim 10, characterized in that an overheated steam at low pressure is used at a temperature ranging between 120 and 160° C.

12. A method as claimed in one of the claims 1 to 11, characterized in that, under the finishing layer (4,4'), a layer of flexible synthetic foam is applied.

13. A method as claimed in one of the claims 1 to 12, characterized in that use is made of a liquid comprising NCO-groups in such a concentration that the latter provides a nearly solid structure by the reaction of the steam with the layer of nearly flexible synthetic foam (1).

14. A method as claimed in one of the claims 1 to 13, characterized in that use is made of a layer of a nearly solid material which is compressed with the impregnated synthetic foam layer (1).

15. A method as claimed in one of the claims 1 to 14, characterized in that use is made of a layer (1) from a substan tially open cell flexible polyether foam and that the latter is at least partially impregnated with an isocyanate solution.

16. A method as claimed in one of the claims 1 to 15, characterized in that the synthetic foam (1) is at least partially impregnated with a diphenylmethane-4,4'-diisocyanate and/or derivatives thereof.

17. A method as claimed in one of the claims 1 to 16, characterized in that the synthetic foam (1) is at least partially impregnated with a prepolymer on the basis of diphenylmethane-4,4'-diisocyanate and/or derivatives thereof.

18. A method as claimed in one of the claims 1 to 17, characterized in that use is made of NCO-groups comprising mixture with polyols , softeners, solvents and inhibitors which temporarily block the reaction between the polyols and the NCO-groups in such a manner that an excess of free NCO-groups remains present at the moment steam is added.

19. Roof covering, door panel, back shelf, floor mat, hood insulation and others for automobiles, obtained by application of the method according to one of the claims 1 to 18.

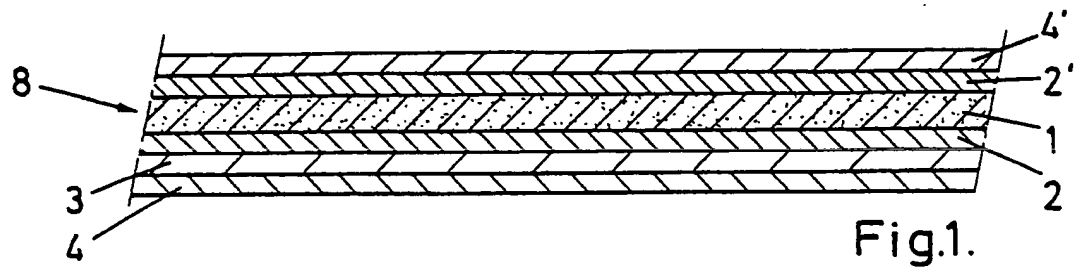

Fig.1.

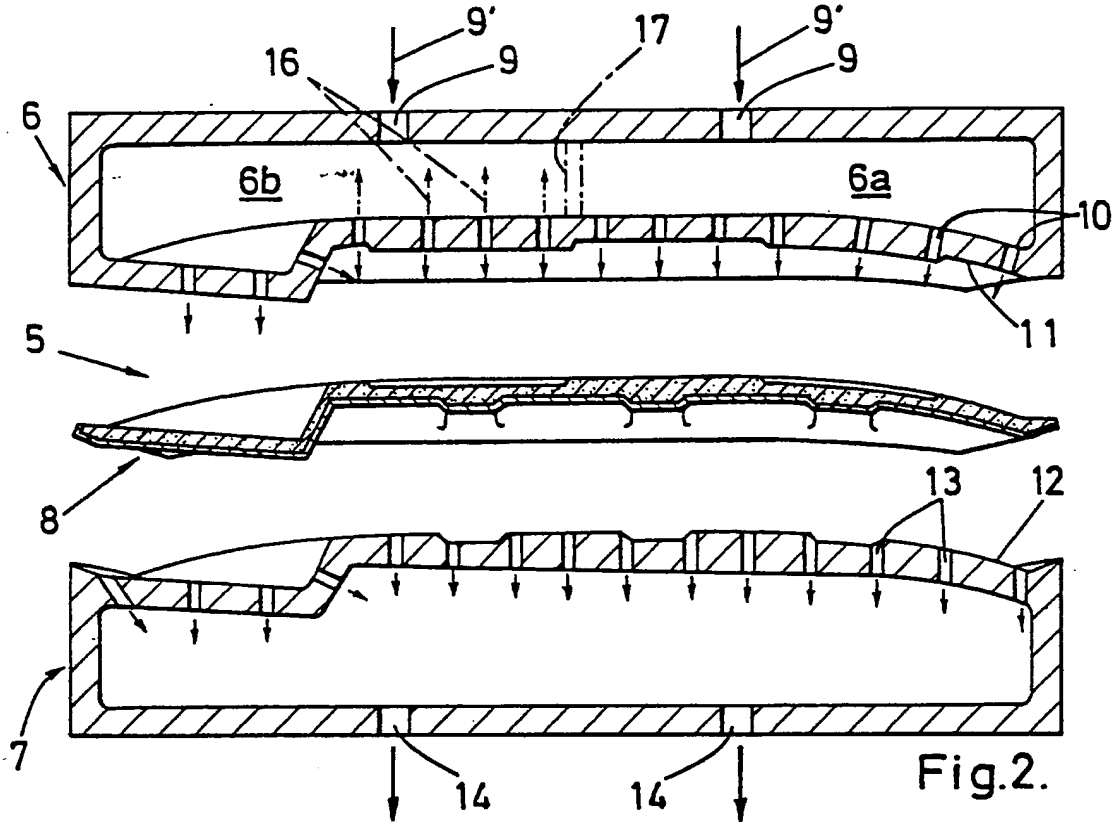

Fig.2.

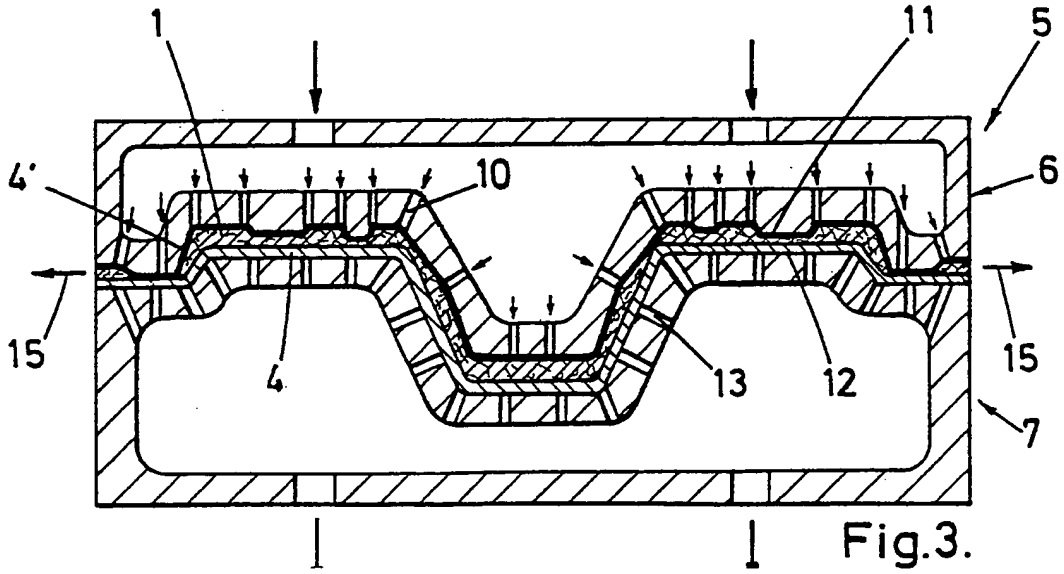

Fig.3.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 20 0457

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	FR-A-2 540 427 (J. SANSON) * Claims 1,2,4,5,6; page 2, lines 6-10; page 3, lines 6-15; example 4; figures 8,9,10 *	1-5,10-13,15-19 1-8,10-13,15-19	C 08 J 9/40 C 08 J 9/42 B 29 C 67/20 B 32 B 5/18
Y	GB-A-2 096 653 (NOBEL-BOZEL) * Claims; page 1, lines 4-14,39-58,83-118; page 1, line 123 - page 2, line 49; page 2, lines 56-62; figure *	1-8,10-13,15-19	
A	US-A-4 718 153 (D.H. ARMITAGE et al.) * Claim 1,2,3,26,33; column 8, line 48 - column 10, line 7; figures 1a,2a *	1,6,7,8,10	
A	GB-A-2 045 684 (WAKO KEMIKAKU K.K.) * Claims; page 1, lines 47-55; page 2, lines 6-22 *	1,19	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	CHEMICAL ABSTRACTS, vol. 109, no. 18, 31st October 1988, page 74, abstract no. 151067x, Columbus, Ohio, US; & JP-A-63 135 240 (BRIDGESTONE CORP.) 07-06-1988	1,19	C 08 J B 29 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-07-1990	HALLEMEESCH A.D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)